STORMWATER REPORT
WOODSOM FARM SOCCER FIELDS
LION'S MOUTH ROAD
AMESBURY, MASSACHUSETTS

Prepared for:

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Project 14028
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1.0 INTRODUCTION

On behalf of the Amesbury Soccer Association, (ASA), Oak Consulting Group, LLC (OCG) has prepared the following Stormwater Report to construct soccer fields at the Woodsom Farm property located on Lion's Mouth Road in Amesbury, Massachusetts. The purpose of this report is to document compliance with the Massachusetts Department of Environmental Protection's Stormwater Policy.

1.1 Current Conditions

The project site (Lease Area) consists of an approximately 10.1-acre portion of the Woodsom Farm property under a lease agreement between the ASA and the City of Amesbury for construction of the proposed soccer fields. The Lease Area is currently occupied by maintained agricultural fields in passive recreational use except that approximately 2.2 acres of the site have been improved and are maintained as athletic playing fields.

There are freshwater bordering vegetated wetlands (BVW) located to the northeast and southwest of the Lease Area. These resource areas are all located outside the Lease Area; however the associated 100-foot buffer zones extend into the eastern end of the project site. The BVW resource area to the southwest contains a small (approximately 0.5 acres) pond. Additionally, approximately 3.6 acres in the northwest portion of the Lease Area is located within the City of Amesbury Zone C Water Resources Protection District. Wetlands resource areas and associated buffer zones are shown on the project plans.

Site topography provides gentle slopes in various directions with localized high and low spots. As shown on the Pre-Development Watershed Plan DR-1, pre-development Watersheds 1A and 1B flow to the BVW to the northeast and pre-development Watershed 2 flows to the BVW to the southwest. All stormwater flows overland across the vegetated surfaces. There are no impervious surfaces or stormwater Best Management Practices (BMPs) within the Lease Area or surrounding land receiving runoff from the project site.

1.2 Site Geology and Hydrogeology

Test pits excavated within the Lease Area indicate that site soils are comprised of fine sandy loam topsoil and fine sandy loams subsoils with many bits of weathered rock fragments. The soils are well drained in most locations except that rock fragments were observed to be tightly-packed in some locations which may restrict percolation rates. Indicators of Estimated Seasonal High Ground Water (ESHGW) were encountered in certain test pits excavated at lower elevations in the southern and eastern portions of the Lease Area. Depths to ESHGW in test pits within the Lease Area varied between 33 to 50 inches. For most of the test pits excavated within the Lease Area, evidence of ESHGW was not reported above the typical excavation depth of 48 inches. Ledge was encountered approximately 12 inches below ground surface at a knoll/high point in the northern portion of the site (Test Pit 6B) and at 32 and 37 inches below ground surface at nearby Test Pits 7E and 5E, respectively. The ledge encountered was described as loose and easily fractured shale.

According to the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Map for Essex County, soils within the Lease Area are classified as Charlton fine sandy loam. Based on the soil information provided by the test pits and NRCS, site soils are identified as hydrologic soil group A. Test pit logs and an NRCS map are provided in Appendix D

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1.3 Proposed Improvements

The Project consists of constructing soccer fields within the lease area. Additional improvements include an irrigation system and stone dust paths to provide access to the fields. No impervious surfaces, parking areas, buildings, or other site improvements are proposed beyond the fields themselves and supporting infrastructure.

The general layout of the fields, which are sized in accordance with U.S. Youth Soccer recommendations for various age groups, and is shown on Sheet C-2. However, it will be necessary to "rest" portions of the fields during certain seasons so the layout has been designed to accommodate alternative configurations which will likely include rotating the field orientation by 90 degrees. As such, the design proposes three general field areas designated as Areas A, B and C on the project plans.

As shown on the plans, field construction will include installation of underdrains to promote proper drainage of the playing surfaces. An irrigation system is also proposed which will connect to a new water supply well to be installed at the site. The proper field drainage and irrigation system will help increase the durability of the fields and ease long term maintenance burdens.

Stormwater patterns in the Post-development condition will be consistent with the Pre-development condition whereby the majority of the site will drain to the BVW located to the northeast and the remainder to the BVW and pond to the southwest. The post development drainage model establishes Subcatchments 1A through 1F to model the individual areas within the overall area draining to the northeast. Proposed stormwater BMPs consist of area drains located in proposed low points and conveyance piping connected to the field underdrains. The proposed design also includes a stormwater infiltration basin which has been modeled in HydroCAD as Pond 1C. The overall drainage design will serve to provide detention and promote ground water recharge.

2.0 STORMWATER MANAGEMENT STANDARDS CONFORMANCE

The measures taken to address each of the performance standards of the Massachusetts Department of Environmental Protection Stormwater Policy are presented below.

2.1 Untreated Stormwater (Standard 1)

The proposed project will not result in new discharges or outfalls. Existing stormwater runoff patterns will be maintained.

2.2 Post-Expansion Peak Discharge Rates (Standard 2)

Pre- and Post-Development runoff rates were calculated using HydroCAD. As shown in the table below, peak discharge rates from the project will not increase in the Post-Development condition. HydroCAD calculations are enclosed as Appendix C.

	Rainfall Events			
	2-Year (3.1 Inches)	**10-Year (4.6 Inches)**	**25-Year (5.5 Inches)**	**100-Year (6.7 Inches)**
To BVW Northeast				
Existing (cfs)	0.00	0.15	0.64	2.28
Proposed (cfs)	0.00	0.10	0.39	1.40
Change (cfs/%)	**--**	**-0.05(-33%)**	**-0.25(-39%)**	**-0.88(-39%)**
To BVW Southwest				
Existing (cfs)	0.00	0.02	0.08	0.27
Proposed (cfs)	0.00	0.01	0.04	0.13
Change (cfs/%)	**--**	**-0.01(-50%)**	**-0.04(-50%)**	**-0.14(-52%)**

2.3 Recharge to Groundwater (Standard 3)

No impervious surfaces are proposed. Therefore, the calculated recharge volume is zero. The intent of this standard to ensure that the infiltration volume into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions is met by grass surfaces across the project area for both conditions. As indicated in Section 2.2 above, peak runoff from the site will be reduced in the Post-Development condition. This reduction is indicative of an increase in ground water recharge. No specific recharge BMPs are proposed.

2.4 Water Quality (Standard 4)

No impervious surfaces are proposed. Therefore the calculated water quality volume is zero. Total Suspended Solids (TSS) removal will be achieved by filtration through the grass surface of the proposed fields and surrounding vegetated areas. No specific water quality BMPs are proposed.

2.5 Land Uses with Higher Potential Pollutant Loads (Standard 5)

The proposed land use as an athletic field does not meet the definition of a Land Use with Higher Potential Pollutant Loads (LUHPPL) as defined by the MA DEP.

2.6 Protection of Critical Areas (Standard 6)

The site does not contain critical environmental resource areas.

2.7 Redevelopment Project (Standard 7)

The project is considered a Redevelopment Project; however all standards have been met in full. The site is currently developed with athletic fields and agricultural fields being used for passive recreation. The athletic fields use will be expanded; however, no impervious surfaces are proposed.

2.8 Construction Period Erosion/Sediment Control (Standard 8)

Erosion and sediment control barriers are proposed along down-slope limits of work as shown on the project plans. These measures will be installed prior to the start of work and maintained by the Contractor for the duration of project construction. Additional Erosion control notes and required measures are provided on Sheet C-5.

The project will disturb more than one acre and require a Stormwater Pollution Prevention Plan (SWPPP) under the National Pollution Discharge Elimination System (NPDES) Construction General Permit (CGP). The SWPPP will be prepared prior to filing the NOI for coverage under the CGP and the start of construction.

2.9 Operation and Maintenance Plan (Standard 9)

Field maintenance and operations will be performed by ASA and consist of mowing the grass and applying fertilizer as necessary to maintain the playing surface. Other maintenance operations may include localized repairs of damaged areas as needed. An Operation and Maintenance (O&M) Plan has been prepared and is enclosed as Appendix B.

2.10 Prohibition of Illicit Discharges (Standard 10)

The project consists of athletic fields and does not include any illicit discharges.

APPENDIX A

Stormwater Checklist

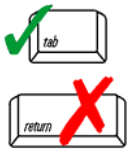
Stormwater Report
Woodsom Farm Soccer Fields
Lions Mouth Road
Amesbury, Massachusetts

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

12/12/14

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☒ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☒ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☒ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☒ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX B

Operations and Maintenance Plan

Stormwater Report
Woodsom Farm Soccer Fields
Lions Mouth Road
Amesbury, Massachusetts

LONG TERM POLLUTION PREVENTION AND STORMWATER OPERATION AND MAINTENANCE PLAN
WOODSOM FARM SOCCER FIELDS
LION'S MOUTH ROAD
AMESBURY, MASSACHUSETTS

Prepared for:

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P.O. Box 127
Amesbury, Massachusetts

Prepared by:

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December 8, 2014

1.0 INTRODUCTION

The following Long Term Pollution Prevention and Operation and Maintenance (O&M) Plan has been prepared to implement pollution prevention measures and stormwater management system operation and maintenance procedures for the Woodsom Farm Soccer Fields. This plan has been prepared to identify pollution prevention measures which are implemented as part of daily campus operations as well as O&M practices and procedures for stormwater Best Management Practices (BMPs).

Owner

Amesbury Soccer Association
P.O. Box 127
Amesbury, Massachusetts 01913

2.0 POLLUTION PREVENTION

The following section presents methods and procedures implemented as part of daily operations to minimize potential stormwater pollution. The procedures presented below have been developed to be practical to implement and sufficiently protective of nearby resource areas and the environment in general.

2.1 Vehicle Parking

Off-street vehicle parking is provided in gravel parking areas located in portions of the greater Woodsom Farm property beyond the Amesbury Soccer Association (ASA) Lease Area. No vehicle parking improvements or associated Operation and Maintenance (O&M) procedures are proposed for this project.

2.2 Housekeeping

Cleanup to remove accumulated trash and debris shall be performed on both an as-needed and scheduled basis. Personnel shall be responsible for removing litter as well as other natural debris, such as fallen branches. Competitors, coaches, officials and spectators are prohibited from littering and are encouraged to pickup miscellaneous debris which they may encounter.

3.0 OPERATION AND MAINTENANCE

Facility personnel shall inspect the stormwater management systems on a routine basis. Inspection and maintenance shall be performed as follows:

3.1 Field Maintenance

Field maintenance and operations will be performed by ASA and consist of mowing the grass and applying fertilizer as necessary to maintain the playing surface. Fertilizer application will be limited to playing fields themselves and under no circumstances extend beyond the limits of the ASA Lease Area. Other maintenance operations may include localized repairs of damaged areas as needed.

3.2 Catch Basins and Manholes

Area drains shall be inspected for accumulation of silt, sediment, or debris on a semi-annual basis. Cleaning will be performed if the sediment level rises 2 feet above the bottom of the sump. Removed sediment will be disposed off site by a qualified waste disposal contractor in accordance with state and federal regulations.

APPENDIX C

Drainage Calculations

Stormwater Report
Woodsom Farm Soccer Fields
Lions Mouth Road
Amesbury, Massachusetts

LEGEND

- LEASE AREA
- 123 EXISTING CONTOUR
- A25 WETLANDS FLAG
- WETLANDS LINE
- 25 FT WETLAND BUFFER
- 100 FT WETLAND BUFFER
- WATERSHED BOUNDARY
- TC FLOW PATH
- 1A WATERSHED NUMBER

1A

1B

2

WIRE FENCE

WOOD POST

CONC.

GATE

EXIST. UTILITY POLE TYP.

WF

0 20 40 80

SCALE in FEET
1"=40'

WOODSOM FARM
SOCCER FIELDS

Prepared for:

AMESBURY SOCCER ASSOC.
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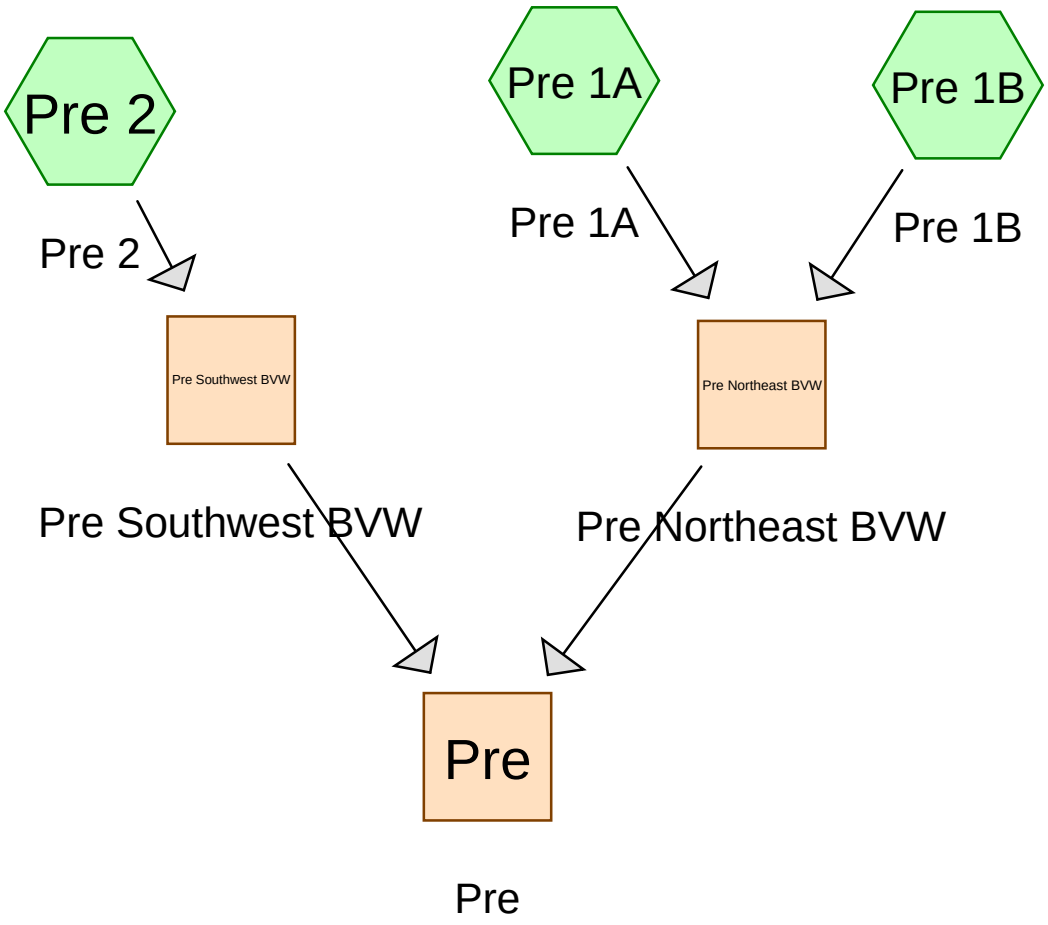
PRE-DEVELOPMENT
WATERSHED PLAN

No.	Revision/Issue	Date

Design by: PFA	Checked by: SPM
Drawn by: PFA	
Project: 14028	Date: NOVEMBER 26, 2014

Sheet:

DR-1



Subcat Reach Pond Link

Routing Diagram for 14028 Pre-Post
Prepared by {enter your company name here}, Printed 12/5/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPre 1A: Pre 1A Runoff Area=141,405 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=530' Slope=0.0530 '/' Tc=24.7 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPre 1B: Pre 1B Runoff Area=240,937 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=479' Slope=0.0480 '/' Tc=24.0 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPre 2: Pre 2 Runoff Area=57,206 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=267' Slope=0.0060 '/' Tc=42.5 min CN=39 Runoff=0.00 cfs 0.000 af

Reach Pre: Pre Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach Pre Northeast BVW: Pre Northeast BVW Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach Pre Southwest BVW: Pre Southwest BVW Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
141,405	39	>75% Grass cover, Good, HSG A
141,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.7	530	0.0530	0.36		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
240,937	39	>75% Grass cover, Good, HSG A
240,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	479	0.0480	0.33		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2: Pre 2

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
57,206	39	>75% Grass cover, Good, HSG A
57,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
42.5	267	0.0060	0.10		**Lag/CN Method, Pre 2**

Summary for Reach Pre: Pre

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Northeast BVW: Pre Northeast BVW

Inflow Area = 8.777 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Southwest BVW: Pre Southwest BVW

Inflow Area = 1.313 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPre 1A: Pre 1A Runoff Area=141,405 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=530' Slope=0.0530 '/' Tc=24.7 min CN=39 Runoff=0.06 cfs 0.034 af

SubcatchmentPre 1B: Pre 1B Runoff Area=240,937 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=479' Slope=0.0480 '/' Tc=24.0 min CN=39 Runoff=0.09 cfs 0.057 af

SubcatchmentPre 2: Pre 2 Runoff Area=57,206 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=267' Slope=0.0060 '/' Tc=42.5 min CN=39 Runoff=0.02 cfs 0.013 af

Reach Pre: Pre Inflow=0.17 cfs 0.104 af
Outflow=0.17 cfs 0.104 af

Reach Pre Northeast BVW: Pre Northeast BVW Inflow=0.15 cfs 0.091 af
Outflow=0.15 cfs 0.091 af

Reach Pre Southwest BVW: Pre Southwest BVW Inflow=0.02 cfs 0.013 af
Outflow=0.02 cfs 0.013 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.104 af Average Runoff Depth = 0.12"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 0.06 cfs @ 14.85 hrs, Volume= 0.034 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
141,405	39	>75% Grass cover, Good, HSG A
141,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.7	530	0.0530	0.36		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

Runoff = 0.09 cfs @ 14.84 hrs, Volume= 0.057 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
240,937	39	>75% Grass cover, Good, HSG A
240,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	479	0.0480	0.33		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2: Pre 2

Runoff = 0.02 cfs @ 15.06 hrs, Volume= 0.013 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
57,206	39	>75% Grass cover, Good, HSG A
57,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
42.5	267	0.0060	0.10		**Lag/CN Method, Pre 2**

Summary for Reach Pre: Pre

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10-Year event
Inflow = 0.17 cfs @ 14.87 hrs, Volume= 0.104 af
Outflow = 0.17 cfs @ 14.87 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Northeast BVW: Pre Northeast BVW

Inflow Area = 8.777 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10-Year event
Inflow = 0.15 cfs @ 14.84 hrs, Volume= 0.091 af
Outflow = 0.15 cfs @ 14.84 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Southwest BVW: Pre Southwest BVW

Inflow Area = 1.313 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10-Year event
Inflow = 0.02 cfs @ 15.06 hrs, Volume= 0.013 af
Outflow = 0.02 cfs @ 15.06 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPre 1A: Pre 1A Runoff Area=141,405 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=530' Slope=0.0530 '/' Tc=24.7 min CN=39 Runoff=0.24 cfs 0.083 af

SubcatchmentPre 1B: Pre 1B Runoff Area=240,937 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=479' Slope=0.0480 '/' Tc=24.0 min CN=39 Runoff=0.41 cfs 0.142 af

SubcatchmentPre 2: Pre 2 Runoff Area=57,206 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=267' Slope=0.0060 '/' Tc=42.5 min CN=39 Runoff=0.08 cfs 0.033 af

Reach Pre: Pre Inflow=0.69 cfs 0.259 af
Outflow=0.69 cfs 0.259 af

Reach Pre Northeast BVW: Pre Northeast BVW Inflow=0.64 cfs 0.225 af
Outflow=0.64 cfs 0.225 af

Reach Pre Southwest BVW: Pre Southwest BVW Inflow=0.08 cfs 0.033 af
Outflow=0.08 cfs 0.033 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.259 af Average Runoff Depth = 0.31"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 0.24 cfs @ 12.69 hrs, Volume= 0.083 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
141,405	39	>75% Grass cover, Good, HSG A
141,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.7	530	0.0530	0.36		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

Runoff = 0.41 cfs @ 12.67 hrs, Volume= 0.142 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
240,937	39	>75% Grass cover, Good, HSG A
240,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	479	0.0480	0.33		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2: Pre 2

Runoff = 0.08 cfs @ 13.02 hrs, Volume= 0.033 af, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
57,206	39	>75% Grass cover, Good, HSG A
57,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
42.5	267	0.0060	0.10		**Lag/CN Method, Pre 2**

Summary for Reach Pre: Pre

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth > 0.31" for 25-Year event
Inflow = 0.69 cfs @ 12.70 hrs, Volume= 0.259 af
Outflow = 0.69 cfs @ 12.70 hrs, Volume= 0.259 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Northeast BVW: Pre Northeast BVW

Inflow Area = 8.777 ac, 0.00% Impervious, Inflow Depth > 0.31" for 25-Year event
Inflow = 0.64 cfs @ 12.68 hrs, Volume= 0.225 af
Outflow = 0.64 cfs @ 12.68 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Southwest BVW: Pre Southwest BVW

Inflow Area = 1.313 ac, 0.00% Impervious, Inflow Depth > 0.30" for 25-Year event
Inflow = 0.08 cfs @ 13.02 hrs, Volume= 0.033 af
Outflow = 0.08 cfs @ 13.02 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPre 1A: Pre 1A Runoff Area=141,405 sf 0.00% Impervious Runoff Depth>0.66"
Flow Length=530' Slope=0.0530 '/' Tc=24.7 min CN=39 Runoff=0.84 cfs 0.178 af

SubcatchmentPre 1B: Pre 1B Runoff Area=240,937 sf 0.00% Impervious Runoff Depth>0.66"
Flow Length=479' Slope=0.0480 '/' Tc=24.0 min CN=39 Runoff=1.44 cfs 0.303 af

SubcatchmentPre 2: Pre 2 Runoff Area=57,206 sf 0.00% Impervious Runoff Depth>0.65"
Flow Length=267' Slope=0.0060 '/' Tc=42.5 min CN=39 Runoff=0.27 cfs 0.071 af

Reach Pre: Pre Inflow=2.47 cfs 0.552 af
Outflow=2.47 cfs 0.552 af

Reach Pre Northeast BVW: Pre Northeast BVW Inflow=2.28 cfs 0.481 af
Outflow=2.28 cfs 0.481 af

Reach Pre Southwest BVW: Pre Southwest BVW Inflow=0.27 cfs 0.071 af
Outflow=0.27 cfs 0.071 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.552 af Average Runoff Depth = 0.66"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 0.84 cfs @ 12.56 hrs, Volume= 0.178 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
141,405	39	>75% Grass cover, Good, HSG A
141,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.7	530	0.0530	0.36		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

Runoff = 1.44 cfs @ 12.55 hrs, Volume= 0.303 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
240,937	39	>75% Grass cover, Good, HSG A
240,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	479	0.0480	0.33		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2: Pre 2

Runoff = 0.27 cfs @ 12.82 hrs, Volume= 0.071 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
57,206	39	>75% Grass cover, Good, HSG A
57,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
42.5	267	0.0060	0.10		**Lag/CN Method, Pre 2**

Summary for Reach Pre: Pre

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth > 0.66" for 100-Year event
Inflow = 2.47 cfs @ 12.57 hrs, Volume= 0.552 af
Outflow = 2.47 cfs @ 12.57 hrs, Volume= 0.552 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Northeast BVW: Pre Northeast BVW

Inflow Area = 8.777 ac, 0.00% Impervious, Inflow Depth > 0.66" for 100-Year event
Inflow = 2.28 cfs @ 12.55 hrs, Volume= 0.481 af
Outflow = 2.28 cfs @ 12.55 hrs, Volume= 0.481 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Pre Southwest BVW: Pre Southwest BVW

Inflow Area = 1.313 ac, 0.00% Impervious, Inflow Depth > 0.65" for 100-Year event
Inflow = 0.27 cfs @ 12.82 hrs, Volume= 0.071 af
Outflow = 0.27 cfs @ 12.82 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

WOODSOM FARM
SOCCER FIELDS

Prepared for:

AMESBURY SOCCER ASSOC.
P.O. BOX 127
AMESBURY, MASSACHUSETTS

0 20 40 80
SCALE in FEET
1"=40'

OCG
Oak Consulting Group
P.O. Box 1123
Newburyport, MA 01950
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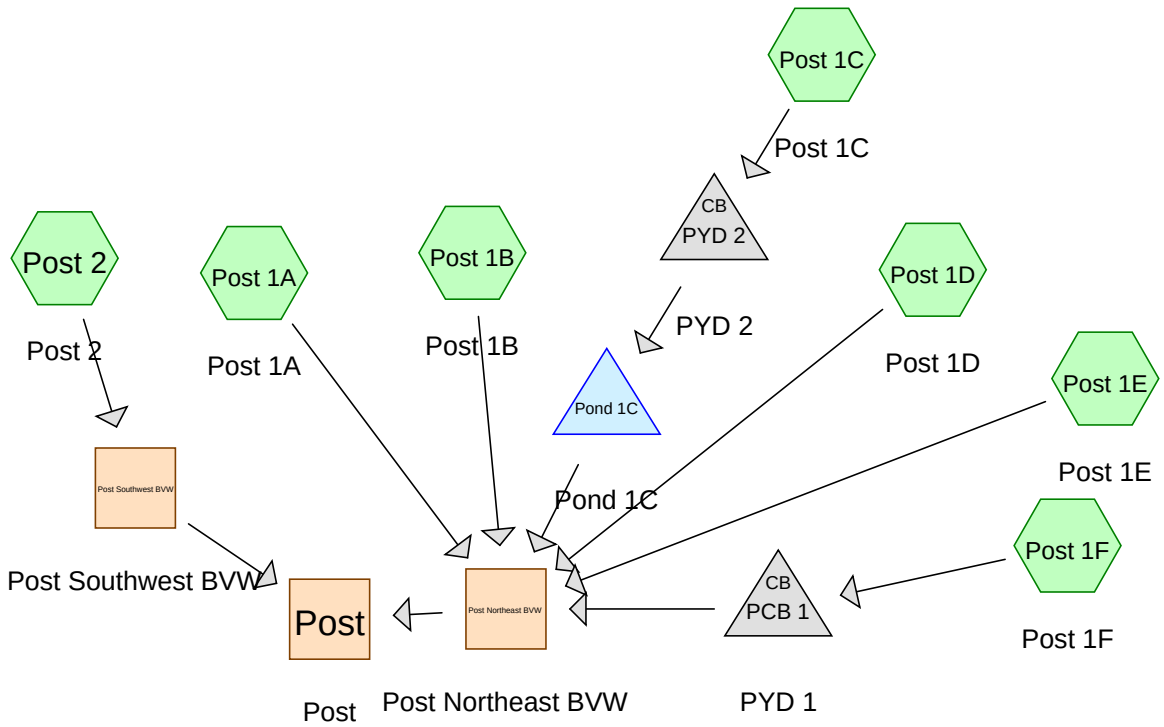
POST-DEVELOPMENT
WATERSHED PLAN

No.	Revision/Issue	Date

Design by: PFA	Checked by: SPM
Drawn by: PFA	
Project: 14028	Date: DECEMBER 10, 2014
Sheet: DR-2	



Subcat Reach Pond Link

Routing Diagram for 14028 Pre-Post
Prepared by {enter your company name here}, Printed 12/5/2014

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPost 1A: Post 1A Runoff Area=59,025 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=456' Slope=0.0200 '/' Tc=35.7 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPost 1B: Post 1B Runoff Area=55,438 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=393' Slope=0.0220 '/' Tc=30.2 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPost 1C: Post 1C Runoff Area=155,777 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=756' Slope=0.0170 '/' Tc=58.0 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPost 1D: Post 1D Runoff Area=79,336 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=234' Slope=0.0170 '/' Tc=22.7 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPost 1E: Post 1E Runoff Area=16,220 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=145' Slope=0.0280 '/' Tc=12.1 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPost 1F: Post 1F Runoff Area=44,649 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=162' Slope=0.0100 '/' Tc=22.1 min CN=39 Runoff=0.00 cfs 0.000 af

SubcatchmentPost 2: Post 2 Runoff Area=29,103 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=310' Slope=0.0060 '/' Tc=47.9 min CN=39 Runoff=0.00 cfs 0.000 af

Reach Post: Post Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach Post Northeast BVW: Post Northeast BVW Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach Post Southwest BVW: Post Southwest BVW Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond PCB 1: PYD 1 Peak Elev=122.70' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.012 L=500.0' S=0.0044 '/' Outflow=0.00 cfs 0.000 af

Pond Pond 1C: Pond 1C Peak Elev=116.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond PYD 2: PYD 2 Peak Elev=118.70' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.012 L=180.0' S=0.0054 '/' Outflow=0.00 cfs 0.000 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Post 1A: Post 1A

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
59,025	39	>75% Grass cover, Good, HSG A
59,025		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	456	0.0200	0.21		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
55,438	39	>75% Grass cover, Good, HSG A
55,438		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	393	0.0220	0.22		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
155,777	39	>75% Grass cover, Good, HSG A
155,777		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.0	756	0.0170	0.22		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 1D: Post 1D

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
79,336	39	>75% Grass cover, Good, HSG A
79,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.7	234	0.0170	0.17		**Lag/CN Method, Post 1D**

Summary for Subcatchment Post 1E: Post 1E

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
16,220	39	>75% Grass cover, Good, HSG A
16,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	145	0.0280	0.20		**Lag/CN Method, Post 1E**

Summary for Subcatchment Post 1F: Post 1F

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
44,649	39	>75% Grass cover, Good, HSG A
44,649		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.1	162	0.0100	0.12		**Lag/CN Method, Post 1F**

Summary for Subcatchment Post 2: Post 2

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
29,103	39	>75% Grass cover, Good, HSG A
29,103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.9	310	0.0060	0.11		**Lag/CN Method, Post 2**

Summary for Reach Post: Post

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Northeast BVW: Post Northeast BVW

Inflow Area = 9.423 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Southwest BVW: Post Southwest BVW

Inflow Area = 0.668 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond PCB 1: PYD 1

Inflow Area = 1.025 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 122.70' @ 0.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	122.70'	**8.0" Round Culvert** L= 500.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 122.70' / 120.50' S= 0.0044 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.70' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)

Summary for Pond Pond 1C: Pond 1C

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 116.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	5,180 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
116.00	0	0	0
117.00	3,040	1,520	1,520
118.00	4,280	3,660	5,180

Device	Routing	Invert	Outlet Devices
#1	Discarded	116.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	117.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#3	Primary	116.75'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.00' (Free Discharge)
├**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond PYD 2: PYD 2

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 118.70' @ 0.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	118.70'	**8.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.70' / 117.72' S= 0.0054 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=118.70' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPost 1A: Post 1A Runoff Area=59,025 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=456' Slope=0.0200 '/' Tc=35.7 min CN=39 Runoff=0.02 cfs 0.014 af

SubcatchmentPost 1B: Post 1B Runoff Area=55,438 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=393' Slope=0.0220 '/' Tc=30.2 min CN=39 Runoff=0.02 cfs 0.013 af

SubcatchmentPost 1C: Post 1C Runoff Area=155,777 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=756' Slope=0.0170 '/' Tc=58.0 min CN=39 Runoff=0.06 cfs 0.036 af

SubcatchmentPost 1D: Post 1D Runoff Area=79,336 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=234' Slope=0.0170 '/' Tc=22.7 min CN=39 Runoff=0.03 cfs 0.019 af

SubcatchmentPost 1E: Post 1E Runoff Area=16,220 sf 0.00% Impervious Runoff Depth>0.13"
Flow Length=145' Slope=0.0280 '/' Tc=12.1 min CN=39 Runoff=0.01 cfs 0.004 af

SubcatchmentPost 1F: Post 1F Runoff Area=44,649 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=162' Slope=0.0100 '/' Tc=22.1 min CN=39 Runoff=0.02 cfs 0.011 af

SubcatchmentPost 2: Post 2 Runoff Area=29,103 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=310' Slope=0.0060 '/' Tc=47.9 min CN=39 Runoff=0.01 cfs 0.007 af

Reach Post: Post Inflow=0.11 cfs 0.067 af
Outflow=0.11 cfs 0.067 af

Reach Post Northeast BVW: Post Northeast BVW Inflow=0.10 cfs 0.060 af
Outflow=0.10 cfs 0.060 af

Reach Post Southwest BVW: Post Southwest BVW Inflow=0.01 cfs 0.007 af
Outflow=0.01 cfs 0.007 af

Pond PCB 1: PYD 1 Peak Elev=122.79' Inflow=0.02 cfs 0.011 af
8.0" Round Culvert n=0.012 L=500.0' S=0.0044 '/' Outflow=0.02 cfs 0.011 af

Pond Pond 1C: Pond 1C Peak Elev=116.52' Storage=411 cf Inflow=0.06 cfs 0.036 af
Discarded=0.04 cfs 0.029 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.029 af

Pond PYD 2: PYD 2 Peak Elev=118.85' Inflow=0.06 cfs 0.036 af
8.0" Round Culvert n=0.012 L=180.0' S=0.0054 '/' Outflow=0.06 cfs 0.036 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.103 af Average Runoff Depth = 0.12"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Post 1A: Post 1A

Runoff = 0.02 cfs @ 14.96 hrs, Volume= 0.014 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
59,025	39	>75% Grass cover, Good, HSG A
59,025		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	456	0.0200	0.21		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

Runoff = 0.02 cfs @ 14.94 hrs, Volume= 0.013 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
55,438	39	>75% Grass cover, Good, HSG A
55,438		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	393	0.0220	0.22		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

Runoff = 0.06 cfs @ 15.39 hrs, Volume= 0.036 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
155,777	39	>75% Grass cover, Good, HSG A
155,777		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.0	756	0.0170	0.22		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 1D: Post 1D

Runoff = 0.03 cfs @ 14.82 hrs, Volume= 0.019 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
79,336	39	>75% Grass cover, Good, HSG A
79,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.7	234	0.0170	0.17		**Lag/CN Method, Post 1D**

Summary for Subcatchment Post 1E: Post 1E

Runoff = 0.01 cfs @ 14.67 hrs, Volume= 0.004 af, Depth> 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
16,220	39	>75% Grass cover, Good, HSG A
16,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	145	0.0280	0.20		**Lag/CN Method, Post 1E**

Summary for Subcatchment Post 1F: Post 1F

Runoff = 0.02 cfs @ 14.81 hrs, Volume= 0.011 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
44,649	39	>75% Grass cover, Good, HSG A
44,649		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.1	162	0.0100	0.12		**Lag/CN Method, Post 1F**

Summary for Subcatchment Post 2: Post 2

Runoff = 0.01 cfs @ 15.16 hrs, Volume= 0.007 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

Area (sf)	CN	Description
29,103	39	>75% Grass cover, Good, HSG A
29,103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.9	310	0.0060	0.11		**Lag/CN Method, Post 2**

Summary for Reach Post: Post

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth > 0.08" for 10-Year event
Inflow = 0.11 cfs @ 14.89 hrs, Volume= 0.067 af
Outflow = 0.11 cfs @ 14.89 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Northeast BVW: Post Northeast BVW

Inflow Area = 9.423 ac, 0.00% Impervious, Inflow Depth > 0.08" for 10-Year event
Inflow = 0.10 cfs @ 14.86 hrs, Volume= 0.060 af
Outflow = 0.10 cfs @ 14.86 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Southwest BVW: Post Southwest BVW

Inflow Area = 0.668 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10-Year event
Inflow = 0.01 cfs @ 15.16 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 15.16 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond PCB 1: PYD 1

Inflow Area = 1.025 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10-Year event
Inflow = 0.02 cfs @ 14.81 hrs, Volume= 0.011 af
Outflow = 0.02 cfs @ 14.81 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 14.81 hrs, Volume= 0.011 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 122.79' @ 14.81 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	122.70'	**8.0" Round Culvert**
			L= 500.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 122.70' / 120.50' S= 0.0044 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.02 cfs @ 14.81 hrs HW=122.79' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.02 cfs @ 0.98 fps)

Summary for Pond Pond 1C: Pond 1C

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10-Year event
Inflow = 0.06 cfs @ 15.39 hrs, Volume= 0.036 af
Outflow = 0.04 cfs @ 18.63 hrs, Volume= 0.029 af, Atten= 38%, Lag= 194.3 min
Discarded = 0.04 cfs @ 18.63 hrs, Volume= 0.029 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 116.52' @ 18.63 hrs Surf.Area= 1,581 sf Storage= 411 cf

Plug-Flow detention time= 140.9 min calculated for 0.029 af (80% of inflow)
Center-of-Mass det. time= 71.7 min (1,144.7 - 1,073.0)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	5,180 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
116.00	0	0	0
117.00	3,040	1,520	1,520
118.00	4,280	3,660	5,180

Device	Routing	Invert	Outlet Devices
#1	Discarded	116.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	117.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#3	Primary	116.75'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 18.63 hrs HW=116.52' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.00' (Free Discharge)
├**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond PYD 2: PYD 2

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth > 0.12" for 10-Year event
Inflow = 0.06 cfs @ 15.39 hrs, Volume= 0.036 af
Outflow = 0.06 cfs @ 15.39 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 15.39 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 118.85' @ 15.39 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	118.70'	**8.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.70' / 117.72' S= 0.0054 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.06 cfs @ 15.39 hrs HW=118.85' (Free Discharge)
1=Culvert (Barrel Controls 0.06 cfs @ 1.53 fps)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPost 1A: Post 1A Runoff Area=59,025 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=456' Slope=0.0200 '/' Tc=35.7 min CN=39 Runoff=0.09 cfs 0.035 af

SubcatchmentPost 1B: Post 1B Runoff Area=55,438 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=393' Slope=0.0220 '/' Tc=30.2 min CN=39 Runoff=0.09 cfs 0.033 af

SubcatchmentPost 1C: Post 1C Runoff Area=155,777 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=756' Slope=0.0170 '/' Tc=58.0 min CN=39 Runoff=0.19 cfs 0.090 af

SubcatchmentPost 1D: Post 1D Runoff Area=79,336 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=234' Slope=0.0170 '/' Tc=22.7 min CN=39 Runoff=0.14 cfs 0.047 af

SubcatchmentPost 1E: Post 1E Runoff Area=16,220 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=145' Slope=0.0280 '/' Tc=12.1 min CN=39 Runoff=0.03 cfs 0.010 af

SubcatchmentPost 1F: Post 1F Runoff Area=44,649 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=162' Slope=0.0100 '/' Tc=22.1 min CN=39 Runoff=0.08 cfs 0.026 af

SubcatchmentPost 2: Post 2 Runoff Area=29,103 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=310' Slope=0.0060 '/' Tc=47.9 min CN=39 Runoff=0.04 cfs 0.017 af

Reach Post: Post Inflow=0.42 cfs 0.188 af
Outflow=0.42 cfs 0.188 af

Reach Post Northeast BVW: Post Northeast BVW Inflow=0.39 cfs 0.171 af
Outflow=0.39 cfs 0.171 af

Reach Post Southwest BVW: Post Southwest BVW Inflow=0.04 cfs 0.017 af
Outflow=0.04 cfs 0.017 af

Pond PCB 1: PYD 1 Peak Elev=122.88' Inflow=0.08 cfs 0.026 af
8.0" Round Culvert n=0.012 L=500.0' S=0.0044 '/' Outflow=0.08 cfs 0.026 af

Pond Pond 1C: Pond 1C Peak Elev=116.80' Storage=979 cf Inflow=0.19 cfs 0.090 af
Discarded=0.06 cfs 0.049 af Primary=0.08 cfs 0.022 af Outflow=0.14 cfs 0.071 af

Pond PYD 2: PYD 2 Peak Elev=118.97' Inflow=0.19 cfs 0.090 af
8.0" Round Culvert n=0.012 L=180.0' S=0.0054 '/' Outflow=0.19 cfs 0.090 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.257 af Average Runoff Depth = 0.31"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Post 1A: Post 1A

Runoff = 0.09 cfs @ 12.89 hrs, Volume= 0.035 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
59,025	39	>75% Grass cover, Good, HSG A
59,025		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	456	0.0200	0.21		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

Runoff = 0.09 cfs @ 12.79 hrs, Volume= 0.033 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
55,438	39	>75% Grass cover, Good, HSG A
55,438		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	393	0.0220	0.22		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

Runoff = 0.19 cfs @ 13.34 hrs, Volume= 0.090 af, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
155,777	39	>75% Grass cover, Good, HSG A
155,777		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.0	756	0.0170	0.22		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 1D: Post 1D

Runoff = 0.14 cfs @ 12.66 hrs, Volume= 0.047 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
79,336	39	>75% Grass cover, Good, HSG A
79,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.7	234	0.0170	0.17		**Lag/CN Method, Post 1D**

Summary for Subcatchment Post 1E: Post 1E

Runoff = 0.03 cfs @ 12.50 hrs, Volume= 0.010 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
16,220	39	>75% Grass cover, Good, HSG A
16,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	145	0.0280	0.20		**Lag/CN Method, Post 1E**

Summary for Subcatchment Post 1F: Post 1F

Runoff = 0.08 cfs @ 12.65 hrs, Volume= 0.026 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
44,649	39	>75% Grass cover, Good, HSG A
44,649		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.1	162	0.0100	0.12		**Lag/CN Method, Post 1F**

Summary for Subcatchment Post 2: Post 2

Runoff = 0.04 cfs @ 13.14 hrs, Volume= 0.017 af, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
29,103	39	>75% Grass cover, Good, HSG A
29,103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.9	310	0.0060	0.11		**Lag/CN Method, Post 2**

Summary for Reach Post: Post

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth > 0.22" for 25-Year event
Inflow = 0.42 cfs @ 12.75 hrs, Volume= 0.188 af
Outflow = 0.42 cfs @ 12.75 hrs, Volume= 0.188 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Northeast BVW: Post Northeast BVW

Inflow Area = 9.423 ac, 0.00% Impervious, Inflow Depth > 0.22" for 25-Year event
Inflow = 0.39 cfs @ 12.72 hrs, Volume= 0.171 af
Outflow = 0.39 cfs @ 12.72 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Southwest BVW: Post Southwest BVW

Inflow Area = 0.668 ac, 0.00% Impervious, Inflow Depth > 0.30" for 25-Year event
Inflow = 0.04 cfs @ 13.14 hrs, Volume= 0.017 af
Outflow = 0.04 cfs @ 13.14 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond PCB 1: PYD 1

Inflow Area = 1.025 ac, 0.00% Impervious, Inflow Depth > 0.31" for 25-Year event
Inflow = 0.08 cfs @ 12.65 hrs, Volume= 0.026 af
Outflow = 0.08 cfs @ 12.65 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.65 hrs, Volume= 0.026 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 122.88' @ 12.65 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	122.70'	**8.0" Round Culvert** L= 500.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 122.70' / 120.50' S= 0.0044 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.08 cfs @ 12.65 hrs HW=122.88' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.08 cfs @ 1.53 fps)

Summary for Pond Pond 1C: Pond 1C

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth > 0.30" for 25-Year event
Inflow = 0.19 cfs @ 13.34 hrs, Volume= 0.090 af
Outflow = 0.14 cfs @ 15.39 hrs, Volume= 0.071 af, Atten= 27%, Lag= 123.1 min
Discarded = 0.06 cfs @ 15.39 hrs, Volume= 0.049 af
Primary = 0.08 cfs @ 15.39 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 116.80' @ 15.39 hrs Surf.Area= 2,439 sf Storage= 979 cf

Plug-Flow detention time= 147.1 min calculated for 0.071 af (79% of inflow)
Center-of-Mass det. time= 68.0 min (1,081.4 - 1,013.4)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	5,180 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
116.00	0	0	0
117.00	3,040	1,520	1,520
118.00	4,280	3,660	5,180

Device	Routing	Invert	Outlet Devices
#1	Discarded	116.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	117.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#3	Primary	116.75'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 15.39 hrs HW=116.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.08 cfs @ 15.39 hrs HW=116.80' (Free Discharge)
├**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)
└**3=Orifice/Grate** (Weir Controls 0.08 cfs @ 0.75 fps)

Summary for Pond PYD 2: PYD 2

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth > 0.30" for 25-Year event
Inflow = 0.19 cfs @ 13.34 hrs, Volume= 0.090 af
Outflow = 0.19 cfs @ 13.34 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 13.34 hrs, Volume= 0.090 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 118.97' @ 13.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	118.70'	**8.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.70' / 117.72' S= 0.0054 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.19 cfs @ 13.34 hrs HW=118.97' (Free Discharge)
1=Culvert (Barrel Controls 0.19 cfs @ 2.13 fps)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPost 1A: Post 1A Runoff Area=59,025 sf 0.00% Impervious Runoff Depth>0.65"
Flow Length=456' Slope=0.0200 '/' Tc=35.7 min CN=39 Runoff=0.30 cfs 0.074 af

SubcatchmentPost 1B: Post 1B Runoff Area=55,438 sf 0.00% Impervious Runoff Depth>0.66"
Flow Length=393' Slope=0.0220 '/' Tc=30.2 min CN=39 Runoff=0.30 cfs 0.069 af

SubcatchmentPost 1C: Post 1C Runoff Area=155,777 sf 0.00% Impervious Runoff Depth>0.65"
Flow Length=756' Slope=0.0170 '/' Tc=58.0 min CN=39 Runoff=0.63 cfs 0.193 af

SubcatchmentPost 1D: Post 1D Runoff Area=79,336 sf 0.00% Impervious Runoff Depth>0.66"
Flow Length=234' Slope=0.0170 '/' Tc=22.7 min CN=39 Runoff=0.48 cfs 0.100 af

SubcatchmentPost 1E: Post 1E Runoff Area=16,220 sf 0.00% Impervious Runoff Depth>0.66"
Flow Length=145' Slope=0.0280 '/' Tc=12.1 min CN=39 Runoff=0.11 cfs 0.021 af

SubcatchmentPost 1F: Post 1F Runoff Area=44,649 sf 0.00% Impervious Runoff Depth>0.66"
Flow Length=162' Slope=0.0100 '/' Tc=22.1 min CN=39 Runoff=0.27 cfs 0.056 af

SubcatchmentPost 2: Post 2 Runoff Area=29,103 sf 0.00% Impervious Runoff Depth>0.65"
Flow Length=310' Slope=0.0060 '/' Tc=47.9 min CN=39 Runoff=0.13 cfs 0.036 af

Reach Post: Post Inflow=1.48 cfs 0.473 af
Outflow=1.48 cfs 0.473 af

Reach Post Northeast BVW: Post Northeast BVW Inflow=1.40 cfs 0.437 af
Outflow=1.40 cfs 0.437 af

Reach Post Southwest BVW: Post Southwest BVW Inflow=0.13 cfs 0.036 af
Outflow=0.13 cfs 0.036 af

Pond PCB 1: PYD 1 Peak Elev=123.04' Inflow=0.27 cfs 0.056 af
8.0" Round Culvert n=0.012 L=500.0' S=0.0044 '/' Outflow=0.27 cfs 0.056 af

Pond Pond 1C: Pond 1C Peak Elev=116.91' Storage=1,256 cf Inflow=0.63 cfs 0.193 af
Discarded=0.07 cfs 0.055 af Primary=0.43 cfs 0.117 af Outflow=0.50 cfs 0.172 af

Pond PYD 2: PYD 2 Peak Elev=119.23' Inflow=0.63 cfs 0.193 af
8.0" Round Culvert n=0.012 L=180.0' S=0.0054 '/' Outflow=0.63 cfs 0.193 af

Total Runoff Area = 10.091 ac Runoff Volume = 0.549 af Average Runoff Depth = 0.65"
100.00% Pervious = 10.091 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment Post 1A: Post 1A

Runoff = 0.30 cfs @ 12.72 hrs, Volume= 0.074 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
59,025	39	>75% Grass cover, Good, HSG A
59,025		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	456	0.0200	0.21		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

Runoff = 0.30 cfs @ 12.64 hrs, Volume= 0.069 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
55,438	39	>75% Grass cover, Good, HSG A
55,438		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	393	0.0220	0.22		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

Runoff = 0.63 cfs @ 13.07 hrs, Volume= 0.193 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
155,777	39	>75% Grass cover, Good, HSG A
155,777		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.0	756	0.0170	0.22		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 1D: Post 1D

Runoff = 0.48 cfs @ 12.53 hrs, Volume= 0.100 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
79,336	39	>75% Grass cover, Good, HSG A
79,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.7	234	0.0170	0.17		**Lag/CN Method, Post 1D**

Summary for Subcatchment Post 1E: Post 1E

Runoff = 0.11 cfs @ 12.37 hrs, Volume= 0.021 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
16,220	39	>75% Grass cover, Good, HSG A
16,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	145	0.0280	0.20		**Lag/CN Method, Post 1E**

Summary for Subcatchment Post 1F: Post 1F

Runoff = 0.27 cfs @ 12.52 hrs, Volume= 0.056 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
44,649	39	>75% Grass cover, Good, HSG A
44,649		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.1	162	0.0100	0.12		**Lag/CN Method, Post 1F**

Summary for Subcatchment Post 2: Post 2

Runoff = 0.13 cfs @ 12.91 hrs, Volume= 0.036 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
29,103	39	>75% Grass cover, Good, HSG A
29,103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.9	310	0.0060	0.11		**Lag/CN Method, Post 2**

Summary for Reach Post: Post

Inflow Area = 10.091 ac, 0.00% Impervious, Inflow Depth > 0.56" for 100-Year event
Inflow = 1.48 cfs @ 12.60 hrs, Volume= 0.473 af
Outflow = 1.48 cfs @ 12.60 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Northeast BVW: Post Northeast BVW

Inflow Area = 9.423 ac, 0.00% Impervious, Inflow Depth > 0.56" for 100-Year event
Inflow = 1.40 cfs @ 12.58 hrs, Volume= 0.437 af
Outflow = 1.40 cfs @ 12.58 hrs, Volume= 0.437 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach Post Southwest BVW: Post Southwest BVW

Inflow Area = 0.668 ac, 0.00% Impervious, Inflow Depth > 0.65" for 100-Year event
Inflow = 0.13 cfs @ 12.91 hrs, Volume= 0.036 af
Outflow = 0.13 cfs @ 12.91 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond PCB 1: PYD 1

Inflow Area = 1.025 ac, 0.00% Impervious, Inflow Depth > 0.66" for 100-Year event
Inflow = 0.27 cfs @ 12.52 hrs, Volume= 0.056 af
Outflow = 0.27 cfs @ 12.52 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.52 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 123.04’ @ 12.52 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	122.70'	**8.0" Round Culvert**
			L= 500.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 122.70' / 120.50' S= 0.0044 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.27 cfs @ 12.52 hrs HW=123.04' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.27 cfs @ 2.19 fps)

Summary for Pond Pond 1C: Pond 1C

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth > 0.65" for 100-Year event
Inflow = 0.63 cfs @ 13.07 hrs, Volume= 0.193 af
Outflow = 0.50 cfs @ 13.53 hrs, Volume= 0.172 af, Atten= 20%, Lag= 27.2 min
Discarded = 0.07 cfs @ 13.53 hrs, Volume= 0.055 af
Primary = 0.43 cfs @ 13.53 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 116.91' @ 13.53 hrs Surf.Area= 2,763 sf Storage= 1,256 cf

Plug-Flow detention time= 80.1 min calculated for 0.172 af (89% of inflow)
Center-of-Mass det. time= 34.2 min (1,007.1 - 972.8)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	5,180 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
116.00	0	0	0
117.00	3,040	1,520	1,520
118.00	4,280	3,660	5,180

Device	Routing	Invert	Outlet Devices
#1	Discarded	116.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	117.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#3	Primary	116.75'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 13.53 hrs HW=116.91' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.43 cfs @ 13.53 hrs HW=116.91' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Weir Controls 0.43 cfs @ 1.30 fps)

Summary for Pond PYD 2: PYD 2

Inflow Area = 3.576 ac, 0.00% Impervious, Inflow Depth > 0.65" for 100-Year event
Inflow = 0.63 cfs @ 13.07 hrs, Volume= 0.193 af
Outflow = 0.63 cfs @ 13.07 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 13.07 hrs, Volume= 0.193 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 119.23' @ 13.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	118.70'	**8.0" Round Culvert** L= 180.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.70' / 117.72' S= 0.0054 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.63 cfs @ 13.07 hrs HW=119.23' (Free Discharge)
1=Culvert (Barrel Controls 0.63 cfs @ 2.87 fps)

APPENDIX D

Soil Data

Stormwater Report
Woodsom Farm Soccer Fields
Lions Mouth Road
Amesbury, Massachusetts

Soil Map—Essex County, Massachusetts, Northern Part

Map Scale: 1:2,550 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 10, Sep 19, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 20, 2010—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Essex County, Massachusetts, Northern Part (MA605)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Water	0.0	0.0%
67A	Leicester fine sandy loam, 0 to 3 percent slopes	0.0	0.0%
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	1.6	9.6%
405B	Charlton fine sandy loam, 3 to 8 percent slopes	14.3	87.3%
405C	Charlton fine sandy loam, 8 to 15 percent slopes	0.5	3.1%
Totals for Area of Interest		**16.4**	**100.0%**

WOODSOM FARM
Soil Analysis

December 1998

Seekamp Environmental Consulting, Inc.
29 South Main Street
Newton, NH 03858
603-382-3896
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Seekamp Environmental Consulting, Inc.

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Seekamp Environmental Consulting, Inc. (SEC), contracted with the City of Amesbury to perform soil investigations at the Woodsom Farm property to help determine future use of two large fields, one south and one north of the main farm buildings. On December 29 and 30, 1998, SEC performed 63 soil test pit analyses covering this approximate 25-acre portion of the Farm. Following is a report describing the methods used, the data, and an analysis of the results.

Methods

Pit locations were marked in a grid pattern on each field. Transect lines were established by pacing at 100 foot intervals across the field, then pit locations were set at 100 foot intervals along each transect line. In some locations, in order to test tops of knolls, the transect line was repositioned, or intermediate transects established.

A small excavator dug pits approximately 4 foot deep, 3 feet wide, and 8 feet long—large enough for a person to enter into the hole to observe the soil layers within the pit. Soil horizons were measured with a measuring tape or rule down the side of the pit. The colors and textures of each horizon were recorded in a field book. Characteristics such as the presence of roots, worms, shale, cobbles, standing water, and ledge were recorded. When observations were complete, the backhoe operator filled the holes and returned the area to original grade.

Two different color manuals were used for determining soil colors—Munsell was used for transects 1 through 4, and EarthColors for transects 0 and 5 through 12. These manuals differ in layout and durability, but are considered equivalent in function.

The percentages of fractured rock were estimated by eye after scraping the pit walls. Estimated Seasonal High Water Tables were determined by noting the presence of redoximorphic features in the soil horizons, in accordance with *Field Indicators for Identifying Hydric Soils in New England.*

The pits on transects 1 through 7 (most of the southern field) were dug, observed, and filled on December 29, under overcast skies and late afternoon drizzle. The pits on transects 0 (southern field) and 8 through 12 (northern field) were dug, observed, and filled on December 30. All pits were observed within 2 hours of their being dug, and were filled by that day's end.

Data

The soil pit logs are attached, with an additional sheet to explain the abbreviations and symbols for the reader. A site plan is attached showing the approximate

locations of the pits across the two fields, with the locations of high groundwater and ledge noted.

Results

- Soil conditions are generally consistent throughout the entire study area.

- The fields have a plowed topsoil layer, approximately 8" -12" thick. This topsoil layer is composed of fine sandy loam, loose and very friable, with many fine roots from the mowed grass above. Small bits of fractured shale constitute a small percentage of the topsoil.

- The subsoil is generally fine sandy loam with many bits of "weathered" sharp rock fragments from crumbly, fractured shale (bedrock or ledge). The rock fragments range in size from ½" to 12", with a few significantly larger, and compose 5% to 70% of this soil horizon depending on the average distance to bedrock. The soils are well drained in most locations. In some locations, the rock fragments are packed into the soil tightly enough to form a somewhat restrictive layer, which can slow the percolation rate.

- In the more southerly portion of the study area (to the left of the barns), estimated seasonal high ground water levels were encountered within 48 inches in the front of the parcel near the pond, and in the right rear corner where the field falls off towards the delineated wetlands. In the northerly field (to the left of the barns), indications of groundwater were encountered in the front near the existing parking area, and in one pit toward the rear corner. The locations and depths of these are identified in greater detail in the data section accompanying this report.

- Ledge was encountered on three knolls within the study area. Two of these are in the southerly field, one mid- field and one at the rear edge, where ledge appears within 12" of the surface. In the northerly field, there is a ridge of ledge along the rear of the field that comes within 12" of the surface. Again, the locations and depths are described on the data sheets in greater detail. The ledge at the surface (within 48 inches) is composed of easily fractured shale, which possibly could be ripped and excavated by machinery without the need for blasting.

Conclusions

The rolling fields of Woodsom Farm are underlain by well-drained, fine sandy loam mixed with varying amount of shale bits from the ledge below. In three places, the ledge appears close to the surface; however, the rock is loose, crumbly shale, and it appears that it could be excavated by machinery or minor blasting if leveling the fields were desirable.

Though most of the area is well drained and the centers of the fields are dry, groundwater levels appear within 4 feet of the surface along some margins of the

fields. If the edges were to be used, drainage control measures or filling might be necessary to avoid groundwater problems.

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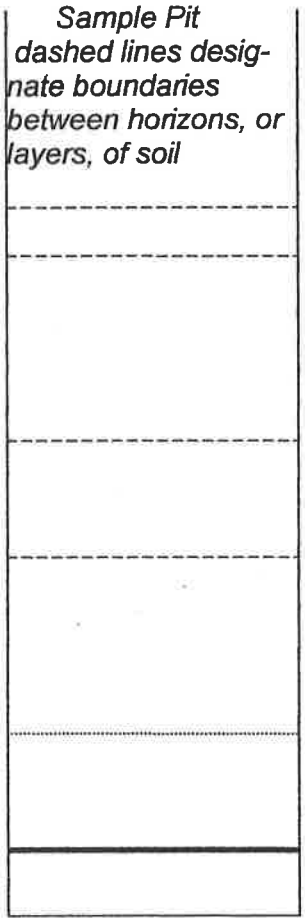
SOIL PIT DATA

SOIL PIT EXPLANATION

Transect # *Transects of 2 to 6 pits each were aligned across the fields at approximately 100 foot intervals. The transects were numbered 0 through 7 on the southern field, and 8 through 12 on the northern field.*

Pit #-letter *The number refers to the transect number, and the letter refers to the pit along that transect.*



Sample Pit dashed lines designate boundaries between horizons, or layers, of soil	*Horizon measuremt*	*Horizon name*
	1" – 0"	grass *varied from short mowed grass to tall field grass*
	0" – 12"	Ap– *plowed (p) topsoil (A), usually dark and uniform from being plowed* Ab– *indicates a layer of topsoil containing burned material.*
	12"-25"	B1 *the first layer of subsoil, generally lighter in color*
	25"-37"	B2 *the second layer of subsoil*
		Dotted line indicates ESHWT, Estimated Seasonal High Water Table—the level groundwater reaches during the wettest seasons
		Heavy solid line indicates ledge, beyond which the hole was not excavated.
		Bottom of pit, approximately 48"

Two manuals were used for determining soil colors of each horizon in the pits. The Munsell manual was used for the pits in transects 0, and 5 through 12. The EarthColors manual was used for the pits in transects 1 through 4. The colors are listed in the column to the right of the horizon designation, and are in the form 10YR 5/6.

In the far right column are descriptions of the soil textures and any features found in the different soil horizons. The presence of roots, worms, fractured rock, and cobbles are noted.

WOODSOM FARM
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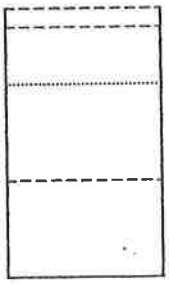
December 1998

Transect 0

Pit 0-A

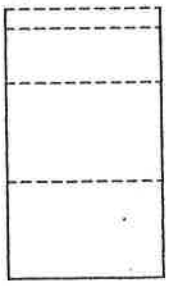


1" – 0"	grass				
0" – 12"	Ap	10YR 3/2	topsoil		fine sandy loam many fine roots
12"	ESHWT				
12" – 30"	B1	10YR 4/2	2.5Y 5/2 depletions 7.5YR 4/6 concentrations		fine sandy loam 5% small stones, fractured shale
30" – 48"	B2	10YR 5/6	2.5Y 6/2 depletions		

Pit 0-B

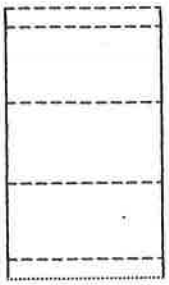
1" – 0"	grass			
0" – 10"	Ap	7.5YR 4/3	topsoil	fine sandy loam, many fine roots
10" – 17"	B1	7.5YR 4/6		fine sandy loam 10% small/medium stones, fractured shale
17" – 48"	B2	10YR 5/6		

Pit 0-C



1" – 0"	grass			
0" – 10"	Ap	7.5YR 4/3	topsoil	fine sandy loam many fine roots
10" –19"	B1	10YR 5/4		fine sandy loam 20% small stones fractured shale
19" – 48"	B2	10YR 5/6		

Pit 0-D



1" – 0"	thick grass			
0" – 11"	Ap	7.5YR4/3	topsoil	fine sandy loam many fine roots
11" – 24"	B1	10YR 4/6		fine sandy loam 20% small stones fractured shale
24" – 48"	B2	10YR 5/6		
50"	ESHWT			fine loamy sand at bottom of hole

Note: Soil colors for Transect 0 were done using EarthColors Manual.

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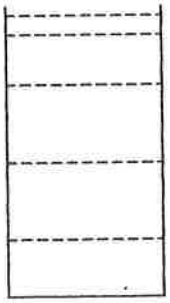
Transect 1

Pit 1-A

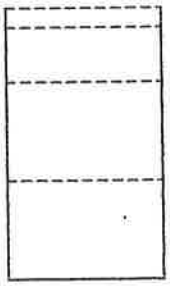
1" – 0"	grass				
0" – 10"	Ap	10YR 3/3	topsoil		loam, loose, very friable; many roots
10" – 18"	B1	10YR 4/4			fine sandy loam
18" ESHWT					
18" – 33"	B2	5Y 5/3	10YR 5/6 many med. 7.5YR 5/6 few fine		fine sandy loam 20% fractured shale
33" – 48"	B3	10YR 5/6	2.5Y 5/2 many common		sandy loam, gravelly

Pit 1-B



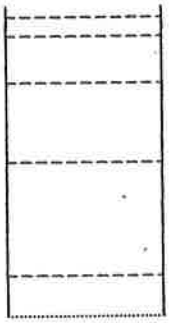
0.5"– 0"	thin grass			
0" – 6"	Ap	10YR 4/3	topsoil	fine sandy loam, few fine roots, many weath'd fragments
6" – 21"	B1	10YR 5/6		fine sandy loam, abundant rock frag. w/gravel, somewhat restrictive at 29"
21" – 30"	B2	2.5Y 5/4		
30" – 48"	B3	2.5Y 5/4 w/ few medium 5YR 3/4 and 7.5YR 5/6 concentrations w/o reductions		

Pit 1-C



1" – 0"	grass			
0" – 8"	Ap	10YR 4/3	topsoil	fine sandy loam many fine roots
8" –23"	B1	10YR 5/6		fine sandy loam 15% small stones fractured shale
23"– 48"	B2	2.5Y 5/6		sandy loam, 50% rotten, crumbly shale, somewhat restrictive

Pit 1-D



1" – 0"	grass			
0" – 11"	Ap	10YR 3/3	topsoil	loam, 5% stone, many fine roots
11" – 27"	B1	2.5Y 5/6		fine sandy loam, 30% small stones fractured shale
27" – 48"	B2	2.5Y 5/4	7.5YR 5/6 many fine 2/5Y 6/4 vertical streaking	fine sandy loam, 10% weathered stone fragments
50" ESHWT				

Note: Soil colors for transects 1 through 4 were done using Munsell Color Manual

WOODSOM FARM
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Transect 1

Pit 1-E 

1" – 0"	thick grass				
0" – 12"	Ap	10YR 3/3	topsoil		loam, loose, very friable, many fine roots, 10% stone
12" – 34"	B1	2.5Y 5/6			fine sandy loam
34" – 48"	B2	2.5Y 5/4	2.5Y 6/4 med.+ coarse, 10%		fine sandy loam,
36" ESHWT			7.5YR 5/6 many fine		coarse and fine rock fragments

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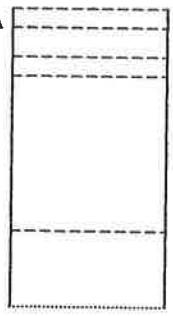
Transect 2

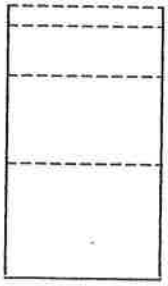
Pit 2-A



1" – 0"	short grass		
0" – 13"	Ap	10YR 3/3 topsoil	fine sandy loam
13"-15"	Ab	black, charcoal black	loam, burned organic material
15"-29"	B1	5Y 5/1 gray, ashen	sandy loam, friable, & crumbly gray sandstone w/ 60% rock fragments
29"-56"	B2	10YR 5/4 w/ 7.5YR 5/6 many conc.	sandy loam with 60% gray rotten rock
56" ESHWT, seeping			

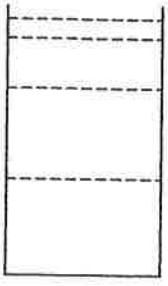
Note: A layer of burned material just under the topsoil appears to have leached the color from the gray rock underneath it, creating a gleyed B1 horizon.

Pit 2-B



1" – 0"	short grass		
0" – 12"	Ap	10YR 3/3 topsoil	loam, loose, very friable, many fine roots
12" – 20"	B1	7.5YR 5/6	fine sandy loam, lg veins shale
20"- 48"	B2	2.5Y 5/6	fine sandy loam, many coarse rock fragments

Pit 2-C



1" – 0"	short grass		
0" – 10"	Ap	10YR 3/3 topsoil	loam, loose, very friable, many fine roots
10" –25"	B1	2.5Y 5/6	fine sandy loam, 30% rock fragments
25" – 48"	B2	10YR 5/6	fine sandy loam, 70% rock, v.shaly

WOODSOM FARM
Soil Pit Data
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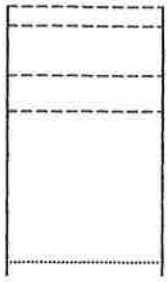
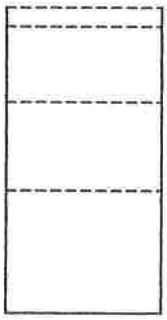
Transect 2

Pit 2-D



1" – 0"	short grass			
0" – 13"	Ap	10YR 3/3	topsoil	fine sandy loam, weath'r'd rock frag.
13" – 22"	B1	2.5Y 5/6		fine sandy loam, many rock frag.
22" – 48"	B2	2.5Y 5/6		fine sandy loam, 50% rock frag., some pockets of no rock
50"	ESHWT			

Pit 2-E



1" – 0"	tall grass			
0" – 14"	Ap	10YR 3/3	topsoil	fine sandy loam, very friable, 10% rock fragments
14"- 26"	B1	2.5Y 5/6		fine sandy loam, 30% shaly
26"- 48"	B2	10YR 5/8		fine sandy loam w/ 50% rotten crumbly shale, somewhat restrictive

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Soil Pit Data
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Transect 3

Pit 3-A

1" – 0"	grass			
0" – 1"	Ap	10YR 3/3	topsoil	fine sandy loam,
4"- 11"	B1	2.5Y 5/3, w/ many fine 10YR 3/6 mottles, no depleted matrix some organic streaking		fine sandy loam 5% small rock fragments
11"- 48"	B2	10YR 4/1, oxidized rhizospheres		firm fine sandy loam
17"	standing water			

Evidence in excavated soil of burned organics—black, mucky peat. Possibly a burned and filled wetland.

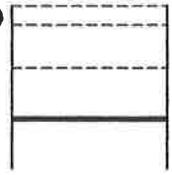
Pit 3-B

1" – 0"	grass			
0" – 10"	Ap	10YR 3/3	topsoil	fine sandy loam, very friable, many fine roots
10" – 48"	B	2.5Y 5/4		sandy loam, 30% rock fragments, and some 5" rounded cobbles

Pit 3-C

1" – 0"	grass			
0" – 10"	Ap	10YR 3/3	topsoil	fine sandy loam, 30% rock fragments
10"- 19"	B1	10YR 5/6		fine sandy loam, 15% rock fragments
19"- 48"	B2	2.5Y 5/6		fine sandy loam, 60% rock fragments & a few cobbles

Pit 3-D

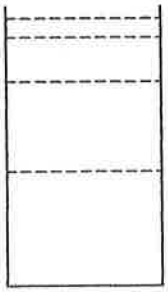


1" – 0"	grass			
0" – 8"	Ap	10YR 3/3	topsoil	fine sandy loam, 30% rock fragments
8"- 12"	B	10YR 5/8		fine sandy loam, 15% rock fragments
12"	ledge			crumbly, fractured ledge

WOODSOM FARM
Soil Pit Data
December 1998

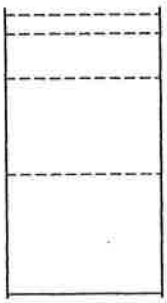
Transect 3

Pit 3-E



1" – 0"	grass			
0" – 9"	Ap	10YR 3/3	topsoil	fine sandy loam, 30% rock fragments
9" - 17"	B1	10YR 5/6		50% crumbly, fractured rock
17"– 48"	B2	2.5Y 5/6		fine sandy loam w/ fractured rock

Pit 3-F



1" – 0"	thick grass			
0" – 9"	Ap	10YR 3/3	topsoil	fine sandy loam, very friable, many fine roots
9" – 22"	B1	10YR 5/6		15% rock fragments from 9" to 36"
22"– 48"	B2	2.5Y 5/6		fine sandy loam, rockier than above

WOODSOM FARM
Soil Pit Data
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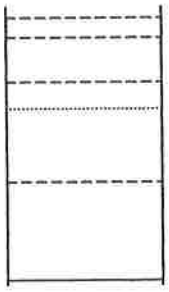
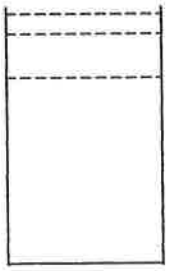
Transect 4

Pit 4-A



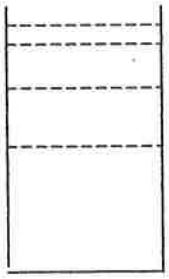
1" – 0"	grass			
0" – 10"	Ap	10YR 3/3	topsoil	fine sandy loam, many fine roots
10" – 20"	B1	2.5Y 5/4		fine sandy loam, 40% sm. rock
15" ESHWT				
20"– 48"	B2	2.5Y 5/3, common 50% 10YR 5/6 redox. features		fine sandy loam 50%fractured rock, angular cobbles

Pit 4-B



1" – 0"	thick grass			
0" – 8"	Ap	10YR 3/3	topsoil	fine sandy loam, shaly to surface
8" – 48"	B	2.5Y 5/4		fine sandy loam, earthworms, large intact rock fragmts.

Pit 4-C



1" – 0"	grass			
0" – 10"	Ap	10YR 3/3	topsoil	fine sandy loam
10" - 23"	B1	10YR 5/6		fine sandy loam, 60% small rock
23"– 48"	B2	2.5Y 5/4		fine sandy loam, earthworms, 30% fractured weathered rock

Pit 4-D

1" – 0"	thick grass			
0" –10"	Ap	10YR 3/3	topsoil	fine sandy loam, very friable, many fine roots
10" – 23"	B1	10YR 5/4		fine sandy loam, earthworms, 60% sm., broken rock
23"– 48"	B2	2.5Y 5/4		fine sandy loam, angular cobbles, lg broken rock frag

Occasional rotten ledge at 15", large rock in ¼ of hole

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Transect 4

Pit 4-E

1" – 0"	grass			
0" – 10"	Ap	10YR 3/3	topsoil	fine sandy loam
10" -48"	B	10YR 5/6		60% fractured rock with angular cobbles

Pit 4-F

1" – 0"	thick grass			
0" – 10"	Ap	10YR 3/3	topsoil	fine sandy loam, many fine broken rock fragments
10"– 16"	B1	10YR 5/6		
16"- 48"	B2	2.5Y 5/6		15% rotten ledge w/ few angular cobbles

WOODSOM FARM
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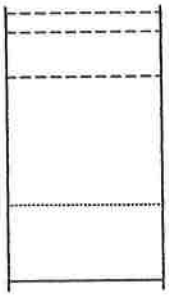
Transect 5

Pit 5-A

1" – 0" grass
0" – 11" Ap 10YR 3/3 topsoil — fine sandy loam, many fine rock fragments
11" - 35" B1 10YR 4/6 — fine sandy loam, 35% fractured rock
35"– 48" B2 2.5Y 4/2, mottles 5YR 4/6 at 42"

Pit 5-B



1" – 0" grass
0" – 14" Ap 10YR 3/3 topsoil — fine sandy loam,
14" – 39" B1 10YR 4.5/4 — fine sandy loam, 25% fractured rock
39" ESHWT
39" – 48" B2 2.5Y 5/3 with 5YR 4/6 concentrations

Pit 5-C

1" – 0" grass
0" – 12" Ap 10YR 3/3 topsoil — fine sandy loam, many fine roots
12" - 27" B1 10YR 4/6 — fine sandy loam, 30% fractured rock
27"– 48" B2 10YR 5/4

Pit 5-D

1" – 0" thick grass
0" – 10" Ap 10YR 3/3 topsoil — fine sandy loam,
10" – 30" B1 10YR 4/6 — fine sandy loam, 50% fractured rock,
30" – 48" B2 10YR 5/4 — fine sandy loam, 50% soft fractured rock

Note: Soil colors for pits 5 through 12 are based on EarthColors manual

WOODSOM FARM
Soil Pit Data
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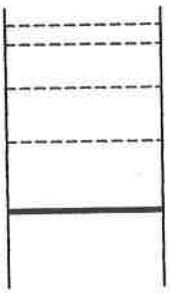
Transect 5

Pit 5-E



1" – 0"	grass			
0" – 12"	Ap	10YR 3/3	topsoil	fine sandy loam, many fine roots
12" - 34"	B1	10YR 4/6		fine sandy loam, 30% fractured rock
34"– 37"	B2	10YR 5/4		
37"	soft rotten ledge			

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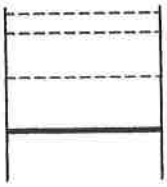
Transect 6

Pit 6-A

1" – 0"	grass			
0" – 12"	Ap	10YR 3/3	topsoil	fine sandy loam, many fine roots
12" - 30"	B1	10YR 4/6		fine sandy loam, 50% fractured rock
30"– 48"	B2	2.5Y 4/3		

Pit 6-B



1" – 0"	grass			
0" – 12"	Ap	10YR 3/3	topsoil	fine sandy loam, many fine roots

12" ledge
This pit is located at the top of a knoll.

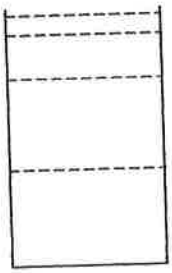
WOODSOM FARM
Soil Pit Data
December 1998

Transect 7

Pit 7-A

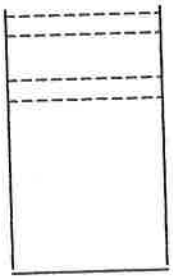
1" – 0"	grass		
0" – 14"	Ap	10YR 3/3 topsoil	fine sandy loam, many fine roots
14" - 33"	B1	2.5Y 5/4	fine sandy loam, 40% fractured rock
33" ESHWT			
33"– 48"	B2	2.5Y 5/2 with 5YR 3/4 concentrations	

Pit 7-B



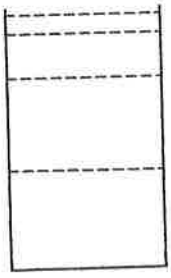
1" – 0"	grass		
0" – 11"	Ap	10YR 3/3 topsoil	fine sandy loam, many fine roots
11" – 24"	B1	10 YR 5/4	fine sandy loam, 50% rock, some large
24" – 48"	B2	2.5Y 4/3	

Pit 7-C



1" – 0"	grass		
0" – 11"	Ap	10YR 3/3 topsoil	fine sandy loam, many fine roots
11" – 15"	B1	10 YR 5/4	fine sandy loam, 5% small stone, some cobbles
15" – 48"	B2	2.5Y 4/3, with veins of sandier inclusions	fine sandy loam, w/loamy sand inclusions

Pit 7-D



1" – 0"	grass		
0" – 14"	Ap	10YR 3/3 topsoil	fine sandy loam, many fine roots
14" – 30"	B1	10 YR 5/4	fine sandy loam, 20% stones, some 5" cobbles
30" – 48"	B2	2.5Y 5/4	

WOODSOM FARM
Soil Pit Data
December 1998

Transect 7

Pit 7-E

1" – 0"	grass			
0" – 11"	Ap	10YR 3/3	topsoil	fine sandy loam, many fine roots
11" - 32"	B	10YR 4/6		fine sandy loam, 20% fractured rock
32"	ledge			

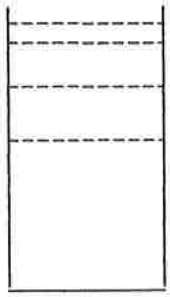
WOODSOM FARM
Soil Pit Data
December 1998

Transect 8

Pit 8-A

1" – 0"	grass			
0" – 11"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
11" - 22"	B1	10YR 4/6		fine sandy loam, 20% fractured rock
22"– 37"	B2	2.5Y 6/3		
37" ESHWT				
37" –48"	B3	2.5Y 5/3 with 10YR 5/4 mottles		

Pit 8-B

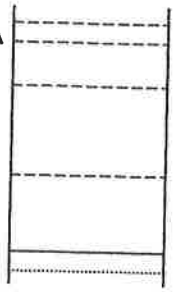


1" – 0"	grass			
0" – 10"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
10" - 28"	B1	10YR 5/6		fine sandy loam, 10% fractured rock, a few cobbles
28"– 48"	B2	10YR 6/6		

WOODSOM FARM
Soil Pit Data
December 1998

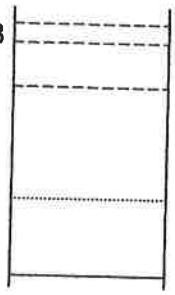
Transect 9

Pit 9-A



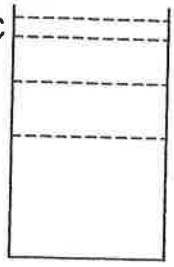
1" – 0" lawn grass
0" – 10" Ap 10YR 3/2 topsoil — fine sandy loam, many fine roots
10" - 35" B1 10YR 5/6 — fine sandy loam, 20% fractured rock and 6" cobbles
35" –48" B2 10YR 5/4
54" ESHWT

Pit 9-B



1" – 0" grass
0" – 15" Ap 10YR 3/2 topsoil — fine sandy loam, many fine roots
15" - 33" B1 2.5Y 5/4 — fine sandy loam, 5% fractured rock
33" ESHWT
33"– 48" B2 2.5Y 5/4 w/ 7.5YR 4/6 concentrations

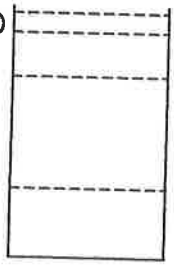
Pit 9-C



1" – 0" lawn grass
0" – 12" Ap 10YR 3/2 topsoil — fine sandy loam, many fine roots
12" - 22" B1 10YR 5/4 — fine sandy loam, 50% fractured rock, 8"-12" flat shale chunks
22" –48" B2 7.5YR 5/6

Manganese and iron on rock surfaces, but so evidence of water table.
Brighter soils below the B2 horizon

Pit 9-D

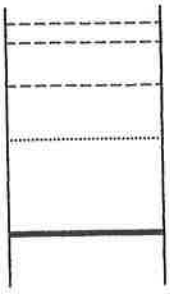


1" – 0" grass
0" – 9" Ap 10YR 3/2 topsoil — fine sandy loam, many fine roots
9" – 30" B1 10YR 5/6 — fine sandy loam, 5% small fractured rock
30"– 48" B2 10YR 5/4

WOODSOM FARM
Soil Pit Data
December 1998

Transect 9

Pit 9-E

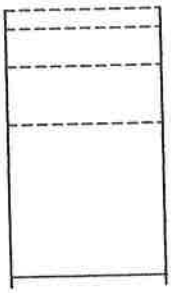


1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 25"	B1	10YR 5/6		fine sandy loam, 10% small fractured rock
25" –38"	B2	2.5Y 5/4		
38" ledge				

WOODSOM FARM
Soil Pit Data
December 1998

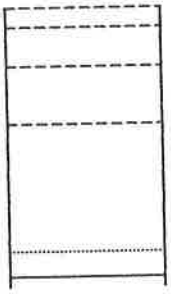
Transect 10

Pit 10-A



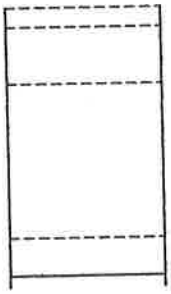
1" – 0"	grass			
0" – 10"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
10" – 23"	B1	10YR 5/6		fine sandy loam, 5% small fractured rock
23" –48"	B2	10YR 6/6		

Pit 10-B



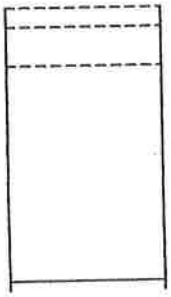
1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" –26"	B1	10YR 5/6		fine sandy loam, 5% small fractured rock
26" –48"	B2	10YR 6/6		
45"	ESHWT	depletions and concentrations in soil		

Pit 10-C



1" – 0"	grass			
0" – 17"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
17" –41"	B1	10YR 5/6		fine sandy loam, 50% small fractured rock
41" –48"	B2	very rocky, very variegated color		

Pit 10-D



1" – 0"	thick grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" –48"	B1	10YR 6/6		fine sandy loam, 40% small fractured rock

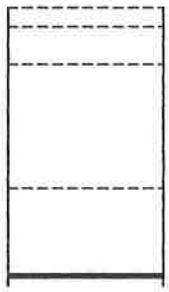
WOODSOM FARM
Soil Pit Data
December 1998

Transect 10

Pit 10-E

1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 35"	B1	10YR 5/6		fine sandy loam, 10% small fractured rock
35" –48"	B2	10YR 6/6		

Pit 10-F

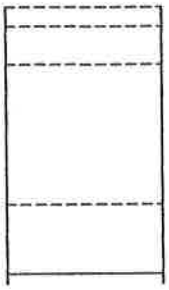


1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 30"	B1	10YR 5/6		fine sandy loam, 10% small fractured rock
30" –48"	B2	10YR 6/6		
48" ledge				

WOODSOM FARM
Soil Pit Data
December 1998

Transect 11

Pit 11-A

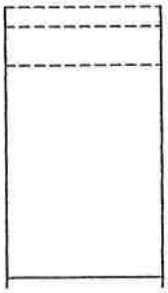


1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 33"	B1	10YR 6/6		fine sandy loam, 5% small fractured rock
33" –48"	B2	2.5Y 6/4		

Pit 11-B

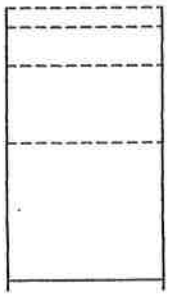
1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 36"	B1	10YR 5/6		fine sandy loam, 10% small fractured rock
36" –48"	B2	10YR 6/6		

Pit 11-C



1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 48"	B	10YR 6/6		fine sandy loam, 5% small fractured rock

Pit 11-D



1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 22"	B1	10YR 5/6		fine sandy loam, 5% small fractured rock
22" –48"	B2	2.5Y 6/3		loamy sand, 5% stone, some large

WOODSOM FARM
Soil Pit Data
December 1998

Transect 11

Pit 11-E

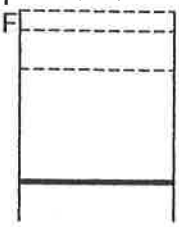
1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 30"	B1	10YR 5/6		fine sandy loam, 40% fractured rock, large slabs of shale
30" –48"	B2	2.5Y 6/3		

Pit 11-F

1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 20"	B1	10YR 5/6		fine sandy loam, 10% small fractured rock
20" ledge				

Pit at top of knoll

Pit 11-FF



1" – 0"	grass			
0" – 10"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
10" – 38"	B	10YR 5/6		fine sandy loam, 50% small broken shale
38" ledge				

WOODSOM FARM
Soil Pit Data
December 1998

Transect 12

Pit 12-A

1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12" – 22"	B1	10YR 6/6		fine sandy loam, 5% small fractured rock
22" –35"	B2	2.5Y 6/4		
35" ESHWT				
35" –48"	B3	2.5Y 5/3 with 7.5YR 4/4 concentrations		

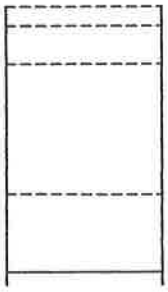
Pit 12-B

1" – 0"	grass			
0" – 11"	Ap	10YR 3/2	topsoil	fine sandy loam
11"– 14"	B1	2.5Y 5/4		fine sandy loam, 5% small fractured rock
14" –48"	B2	2.5Y 5/4		

Pit 12-C

1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12"– 35"	B1	10YR 5/6		fine sandy loam, 5% small fractured rock, some cobbles
35"- 48"	B2	10YR 6/6		

Pit 12-D

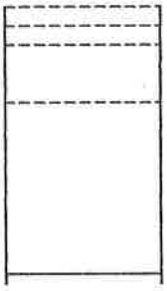


1" – 0"	grass			
0" – 12"	Ap	10YR 3/2	topsoil	fine sandy loam, many fine roots
12"– 34"	B1	10YR 5/6		fine sandy loam, 5% small fractured rock, some 12" cobbles
34" –48"	B2	10YR 6/6		

WOODSOM FARM
Soil Pit Data
December 1998

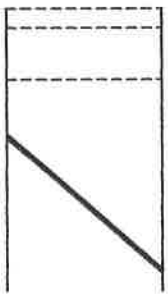
Transect 12

Pit 12-E



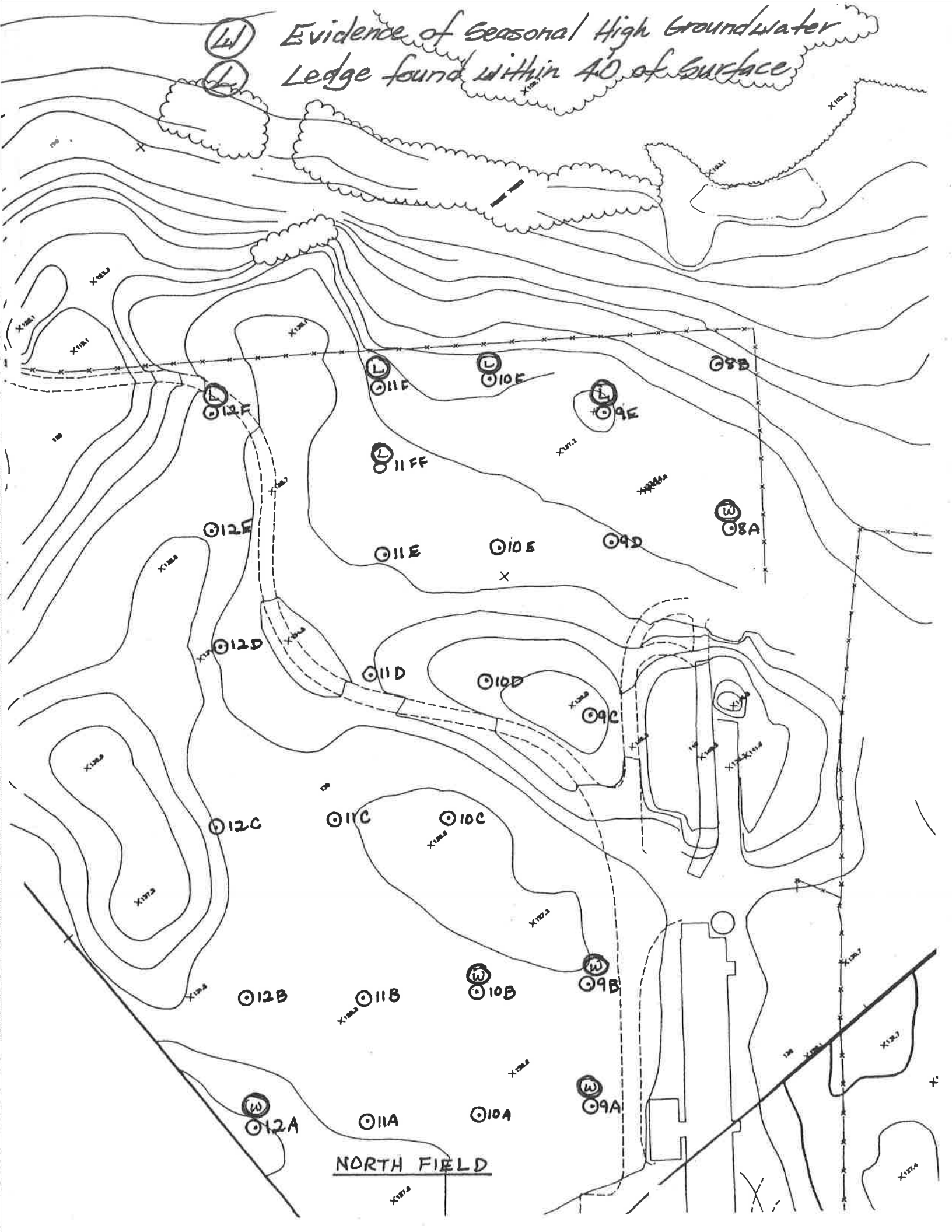
1" – 0"	grass			
0" – 3"	Ap	10YR 3/2	topsoil	fine sandy loam
3" – 12"	B1	2/5Y 5/4		fine sandy loam, 10% fractured rock, some large chunks
12" –48"	B2	2.5Y 5/3		

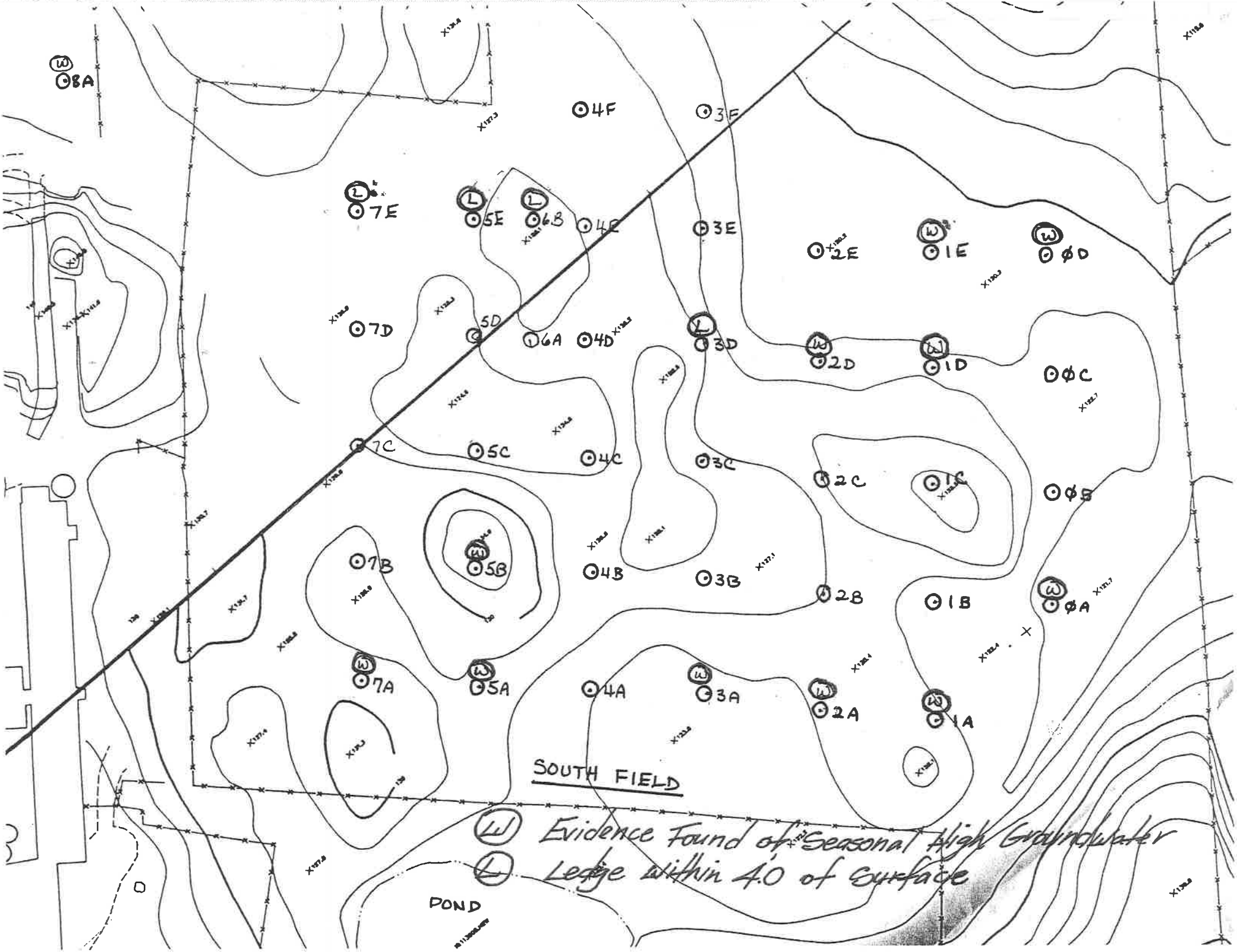
Pit 12-F



1" – 0"	grass			
0" – 8"	Ap	10YR 3/2	topsoil	fine sandy loam
8" – 40"	B	10YR 6/6		fine sandy loam, 50% loose stone

40" ledge
Sloping ledge from 12" at one end of pit to 40" at other end of pit.


Ⓛ/ Evidence of Seasonal High Groundwater
Ⓛ Ledge found within 40 of Surface
12F
11F
10F
9E
8B
11FF
12E
11E
10E
9D
8A
12D
11D
10D
9C
12C
11C
10C
12B
11B
10B
9B
12A
11A
10A
9A
NORTH FIELD


8A
4F
3F
7E
5E
6B
4E
3E
2E
1E
ϕD
7D
5D
6A
4D
3D
2D
1D
ϕC
7C
5C
4C
3C
2C
1C
ϕB
7B
5B
4B
3B
2B
1B
ϕA
7A
5A
4A
3A
2A
1A
SOUTH FIELD
W Evidence Found of Seasonal High Groundwater
L Ledge within 4.0 of Surface
POND